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Meta Analysis

High uric acid level predicts left atrial thrombus or spontaneous echo contrast detected by transesophageal echocardiography: Meta-analysis and systematic review

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Abstract

Background: Recent observational studies have suggested that the patients with hyperuricemia have a higher risk of having left atrial thrombus (LATH) or left atrial spontaneous echo contrast (LASEC) by transesophageal echocardiography (TEE), while the ultimate predictive value of a high uric acid (UA) level on LATH/LASEC remained obscure.

Methods: We searched the PubMed and Cochrane clinical trials databases up to July 2015. Following screening the 369 initially identified studies, we analyzed six observational studies with 2381 patients.

Results: The meta-analysis of these studies showed that an elevated serum UA level was associated with a higher likelihood of LATH/LASEC ($OR = 1.59$, 95%CI 1.13−2.23, $P = 0.008$), while significant differences exist among individual trials ($P < 0.00001$ and $I^2 = 85\%$). Sensitivity analysis failed to find any heterogeneity.

Conclusion: An elevated UA level was associated with a higher risk of detecting a left atrial abnormality represented by LATH/LASEC.

Keywords: Uric acid; Left atrium; Thrombus; Transesophageal echocardiography; Atrial fibrillation

Introduction

An atrial thrombus forming in the left atrial appendage (LAA) in the setting of atrial fibrillation results in a series of adverse outcomes including stroke, myocardial infarction and other severe embolism events. Transesophageal echocardiography (TEE)

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is frequently used to look for an LAA thrombus and can be helpful when conducting risk stratification of patients for stroke.[1]

Hyperuricemia has been shown to be an independent predictor of cardiovascular events.[2] Other studies have investigated the relationship between high levels of serum uric acid (UA) and a left atrial thrombus/left atrial spontaneous echo contrast (LATH)/(LASEC) as detected by TEE and there are conflicting results.[3–8] We conducted a comprehensive meta-analysis and systematic review to investigate the potential relationship between the serum UA level and left atrial thrombi detected by TEE.

Methods

We conducted this analysis according to the guidelines of the Meta-analysis of Observational Studies in Epidemiology Group (MOOSE).[9] Prospective or retrospective observational studies were enrolled with the primary objective of analyzing the association between serum levels of UA and LATH/LASEC. Titles and abstracts of all articles were evaluated and studies were rejected if the following inclusion criteria were not met: 1) human subjects with TEE and corresponding result of LATH/LASEC reported, 2) UA presented as continuous variable, 3) retrospective/prospective cohort studies, 4) baseline data available, 5) detail of LA abnormality detected by TEE mentioned, 6) sample size of more than 50 patients from individual studies.

Search strategies

We performed a search of the on-line databases of PubMed and the Cochrane Controlled Trials Register Databases to July 2015 to identify relevant studies. We used the following keywords: “uric acid”, “hyperuricemia” and “atrial thrombus”, “spontaneous echo contrast”, and “left atrium abnormality”. Titles and abstracts as well as the reference lists of all the identified reports were independently examined by two reviewers (E.Z and T.L.) in order to include potentially relevant studies. The two reviewers agreed on the inclusion/exclusion status in 90% of the reviewed studies. Disagreements were resolved after discussion with a third reviewer (L.K.). There was no language restriction for the inclusion of studies. Additionally, we conducted a manual search using review articles, bibliographies of original papers, and abstracts of the scientific sessions of the American Heart Association, the European Society of Cardiology, the Heart Rhythm Society, and the American College of Cardiology from the past two years.

Quality assessment

To limit heterogeneity secondary to differences between study designs, the quality of each study was evaluated according to the guidelines developed by the Evidence-Based Medicine Working Group[10] and the United States Preventive Task Force.[11] We applied the point score system that assessed the following characteristics: (1) clear description of inclusion and exclusion criteria, (2) study sample representative for the mentioned population, (3) clear description of sample selection, (4) full specification of clinical and demographic variables, (5) complete clinical data such as renal function and echocardiogram parameters, (6) no loss of follow-up, (7) cohort study, (8) clear definition of outcomes and outcome assessment, (9) temporality (assessment of UA level before TEE), and (10) adjustment of possible confounders in multivariate analysis. If one of these key points was not mentioned clearly in a study, we considered it not to have been performed properly. Therefore, the possibility of underestimation of the reported characteristics may be present.

Data extraction

Two blind investigators (E.Z. and T.L.) independently performed data extraction with a standard data extraction form to determine eligibility for inclusion. The following collected information was tabulated: 1) publication details, first author's last name and the publication year, 2) characteristics of included studies, the study population, definition of LA abnormality, quality score, cohort design, risk estimate, and the patients' characteristics, 3) baseline data of the studied population, sample size, age, gender, paroxysmal atrial fibrillation (PAF) (%), LATH/LASEC (%), uric acid (μmol/L), creatinine (μmol/L), left atrium diameter, left ventricle ejection fraction, diabetes mellitus (%), hypertension (%), body mass index (kg/m^2), and left atrial appendage flow velocity (cm/s).

Statistical analysis

The magnitude of the association between high serum UA level and the LATH/LASEC detected by TEE was measured by adjusted *OR*, or by an *OR* with 95% confidence intervals (*CI*s). One study[7] only provided a value of *OR* by univariate analysis because there was no association between the serum UA level and the LATH/LASEC following univariate analysis. We used the inverse variance method to weight studies